movements with their pectoral and ventral fins, but hold them spread out. In the outspread fins there may occur very rapid vibrations.

The hinder part of the body remains somewhat lower than the fore part during flight.

Directly against the wind they commonly fly further than with the wind, or when their course and the direction of the wind form an angle together.

Most exocœti which fly against the wind or with the wind continue during their whole course of flight in the direction in which they come out of the water. Winds coming laterally upon the original course of the exocœti deflect these into their direction.

All exocœti which withdraw from ships fly during their whole course through the air, near the surface of the water.

When with strong winds they fly against the course of the waves, they commonly rise somewhat over each wave; sometimes their tail dips slightly in the top of the wave.

Only those exocœti whose air-course is crossed by a ship rise to considerable heights (at the most about five metres above the surface of the sea).

By day flying fish seldom light on the ship; they mostly do so at night, and never in calm, but only when the wind is blowing. They mostly fall upon ships which lie not higher than two to three metres above water, and when these are sailing on a wind (the wind coming obliquely from beyond) or with half a wind (the wind coming at right angles against the ship), and are sailing rapidly. Flying fish never come on board from the lee side, but always and only from the weather side.

Not uncommonly when their tail has dipped in the water they describe in the horizontal part of their course, a bow to the right or to the left side.

During wind and a rough sea they appear above the water more frequently than in calm weather.

Before ships, which come upon them in swimming, the exocœti escape into the air, just as they do before fishes of prey and cetacea.

Many authors have affirmed, in explaining the flying of fish, that the pectoral fins operate like the wings of birds, bats, and of insects. Prof. Möbius, however, shows that both the anatomical structures of the pectoral fins and their muscles, and the physiological relations of the position and size of the fins to the volume and weight of the whole body, are against flight-like movements of the pectoral fins.

The movements occasionally observed in these organs during flight are merely a vibration.

The true cause of these movements of fishes through the air are the spring-movements which they impart to their body by means of their very strong side muscles, just as other fish propel themselves powerfully through water. They spring out of the water with great velocity, because the air presents less resistance than the water, and when after some time, they fall back into the water, their outspread fins act like a parachute.

It is easy to understand how the action of the wind combines favourably or otherwise with their flight. By day the direction of their spring is so chosen that the disturbing ship is avoided. By night this orientation by the sense of sight is wanting, and the animals fall into the ship. As any air in strong motion, when it impinges against obstacles (a ship's side or waves), rises, it raises also the fish, so that this flies over the wave, or may come on board the ship. In short, as Prof. Möbius proves in detail, all the phenomena observed may be fully explained by the combined action of the oblique projection forwards and the wind. It may further be mentioned that the flying fish has a peculiar arrangement of the mouth, so that in this a portion of water may be carried during flight for the process of respiration.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE*

THE Kingdom of Portugal has for its 4,700,000 inhabitants but a single university—that of Coimbra, which was originally founded at Lisbon in 1290. The university has a corps of instructors numbering 70, is attended by 1,100 students, possesses a library of 42,000 volumes, and is equipped with astronomical and meteorological observatories, as well as natural history collections. Advanced education is likewise provided for by polytechnics, medical academies, and industrial institutes in Lisbon and Oporto, and an agricultural school. The elementary schools of the land number 2,450, and parents lose their political rights if their children cannot read and write at the age of 15.

THE University of Strasburg is attended at present by the largest number of students recorded since its establishment, viz., 710, consisting of 45 in theology, 195 in law, 150 in medicine, 177 in philosophy, and 143 in science.

THE new regulations for medical study in France require a term of four years, five examinations, including one in physics, chemistry, and natural history, practical work in the laboratories and anatomical theatre, and two years visiting of the hospitals. The sum requisite for this course of study is 1,360 francs—520 for lectures, and the remainder for examination fees, thesis, and diploma.

AN examination will begin at Merton College, Oxford, on Tuesday, October 15, for the purpose of electing to a Physical Science Postmastership of the annual value of 80*l.*, and tenable for five years from election. After two years of residence the College will raise, by a sum not exceeding 20*l.* per annum, the postmasterships of such postmasters as shall be recommended by the tutors for their character, industry, and ability. Candidates, if members of the University, must not have exceeded six terms of University standing. Information may be obtained from the tutor in physical science.

MR. SAMUEL SHARPE has promised to give 5,000*l.* towards the building of the north wing of University College, London, so soon as the Council are prepared to begin the work. It is expected that this liberal donation, together with others which have been received, will enable the building to be very shortly commenced. A sum of 50,000*l.* in all will, however, be required to complete the extensions which are immediately contemplated.

## *SOCIETIES AND ACADEMIES*

### LONDON

Anthropological Institute, June 25.—Mr. John Evans, D.C.L., F.R.S., president, in the chair.—Dr. Paul Topinard, of Paris, was elected an Honorary Member, and the election of the following gentlemen as Ordinary Members was announced:—The Rev. H. W. Watkins, Warden of St. Augustine's College, Canterbury; Hy. Wm. Jackson, M.R.C.S., F.R.A.S., F.G.S., of Lewisham, and Dr. Dunkley, of New Zealand.—A paper was read on the ethnology of the islands of the Pacific, by the Rev. S. J. Whitmee. This paper was chiefly intended to explain an ethnographic chart of the Pacific, coloured according to the author's own observations, and which, in the main, followed the divisions of races in previous charts. In speaking of the people, he said the Melanesians, or black race, might be regarded as the aboriginal people, and that they had affinities, more or less remote, with the blacks found in the various parts of the southern hemisphere. Probably these Melanesians once extended further across the Pacific than they now do. The brown Malayo-Polynesian race had, doubtless, entered Polynesia from the west. The difficulties of such a migration were not insuperable. An example was given of a comparatively recent arrival of a vessel thought to be Chinese or Japanese, at Fotuna, or Home Island, containing forty people. There is a third people in Polynesia differing considerably from both of the others. These are the Micronesians. They probably are primarily from the Philippines, or some other portion of the Indian Archipelago, but are mixed with Melanesian and Malayo-Polynesian blood. There is also reason to believe they have had an admixture of Chinese or Japanese blood derived from the occupants of junks which have been driven by adverse winds to this region.—Mr. Worthington G. Smith read a paper descriptive of palæolithic implements from the gravels of N.E. London, and a paper was communicated by Mr. G. M. Atkinson on a new method of finding the cephalic index.

Entomological Society, July 3.—H. W. Bates, F.L.S., F.Z.S., president, in the chair.—Mr. Basil G. Nevinson was elected an Ordinary Member and Mr. John A. Finzi a Subscriber.—M. Pascoe exhibited a number of insects he had collected during a recent tour through Algeria and the south of Spain; with these there was a remarkable myriopod having the cylindrical body of the Julidæ, but with only one pair of legs to each somite.—Mr. Boyd drew attention to the food plant of *Eluchista cerusella*. This insect had always been considered to feed on the leaves of *Arundo phragmites*, which Mr. Boyd doubted, as he had lately found the larva feeding on *Phalaris arundinacea*,

a grass which somewhat resembled the other plant before the flowers appear.—Mr. Distant exhibited some specimens of the homopteron *Ricania australis*, Walk., which had been sent him for identification through Dr. Sharp, from Mr. Lawson, of Auckland, New Zealand, where the species had been observed last year on the dahlia for the first time. These New Zealand forms were, however, much darker in colour than Australian specimens, and hence had probably been introduced for some time. Mr. Jenner Weir exhibited two specimens of *Leucania turca* with several pollinia of *Habenaria bifolia* attached to the trunk of each, and which was only observed in these two instances out of fifty specimens examined. Mr. Weir also exhibited an interesting variety of *Hipparchia hyperanthus*.—Prof. Westwood remarked on a recent note in NATURE, vol. xviii. p. 226, referring to observations made by Dr. A. S. Packard on the manner in which lepidoptera escape from their cocoons, and stated that similar observations had been previously made and recorded by Capt. Hutton (*Trans.* Ent. Soc., 1st. ser. vol. v. p. 85). Prof. Westwood also stated that he had recently heard of injuries done to potato crops by *Cetonia aurata*, which had been found stripping the leaves, and a lepidopterous larva (probably a species of *Botys*), which bored into the stem.—Mr. Dunning read a note on spiders resembling flowers.—The Secretary read a note from Mr. J. Haselden relating to the habits of the honey bee (*Apis fasciata?*) in Egypt.—Mr. Waterhouse communicated a paper on new coleoptera from Australia and Tasmania in the collection of the British Museum.

### CAMBRIDGE

**Philosophical Society**, May 20.—A communication was made by the Rev. E. Hill, on some points connected with the influence of geological changes on the earth's axis of rotation.—The author proved by elementary methods the following results recently obtained by Mr. G. H. Darwin:—(1) That small deformations of the earth cannot alter the position in space of the earth's axis of rotation. For if external forces be neglected this follows immediately from the conservation of angular moments. If we introduce the attractions of the sun and moon, the investigation of precession and nutation will in general still apply to the deformed earth, and the mean obliquity be unchanged. 2. That these deformations cannot sensibly separate the axis of figure from that of rotation. It was shown that as soon as a separation began, the rotation-pole would appear to trace out on the surface a cyclone with its base in the direction along which the figure-pole might be shifting; that the two would coincide about every 300 days, and the greatest divergence thus be infinitesimal. 3. That should the earth yield to strain, these poles would describe a spiral on the surface. This was only shown in a single case. 4. Expansion and contraction will be less effective in shifting the principal axes than transference of surface-matter. For expansion and contraction involve transference of matter from within outwards, or *vice versâ*, and the effect of increase of matter at one point of a radius would be more or less counterbalanced by its subtraction from another point. But transference of matter on the surface may be so arranged that the gain at one point is reinforced by the loss at the other.

### MANCHESTER

**Literary and Philosophical Society**, December 4, 1877.—Transit of the shadow of Titan across the disc of Saturn, November 23, 1877, by Joseph Baxendell, F.R.A.S.

February 11, 1878.—Mr. Binney, F.R.S., sent a marine alga from the Isle of Man for identification. It was not in fruit, but was undoubtedly an unusually narrow fronded form of *Chondrus crispus* (Lamx.).—Mr. C. Bailey, in the absence of Mr. Hurst, read a paper by the latter on the best method of collecting and preserving plants for herbarium purposes, when gathered in tropical or subtropical countries.—Mr. J. Boyd exhibited slides of *Spongilla fluviatilis*, the fresh-water sponge, showing spicules.

February 25.—Results and deductions of rain-gauge observations made at Eccles, near Manchester, during the year 1877, by Thomas Mackereth, F.R.A.S., F.M.S.

March 5.—On the decomposition of ultramarine by carbonic acid, by Mr. S. Sugiura (Student in the Chemical Laboratory of the Owens College). Communicated by Prof. Roscoe, F.R.S.—On siliceous fossilisation, by J. B. Hannay, F.R.S.E., Assistant Lecturer on Chemistry in the Owens College. Communicated by Prof. Roscoe, F.R.S.

March 11.—On bryozoa, by Arthur Wm. Waters, F.G.S.

March 19.—On a remarkable flash of lightning, by B. St. J. B. Joule.—On a barometer, by Dr. J. P. Joule, F.R.S.—A comparison of the standard barometer of the Owens College Physical Laboratory with the working barometer, by Mr. Morisabro Hiraoka, Student of Owens College. Communicated by Prof. B. Stewart, LL.D., F.R.S.—On a new calorimeter, by J. B. Hannay, F.R.S.E., Assistant Lecturer on Chemistry, Owens College.

### VIENNA

**Imperial Academy of Sciences**, March 14.—On processes of degeneration and regeneration in normal peripheric nerves, by Herr Mayer.—Embryology of ferns, by Herr Leitgeb.—New experiments in proof of Döppler's theory of tone and colour variation through motion, by Dr. Mach.—Researches on the origins and the functions of the accelerating nerves, by Dr. Stricker.—On a fluorescein-carbon acid, by Dr. Schreder.—On phenomena in the circulatory apparatus after temporary closure of the aorta (a contribution to physiology of the spinal cord), by Dr. Mayer.—On the salivary glands of *Eledone moschata*, by Dr. Dietl.—On a new geological inclosure in the region of the Carlsbad springs, by Prof. Hochstetter.—On the magnetic declination and inclination at Vienna, by Herr Liznar.—The daily and yearly course of temperature at Port Saïd and Suez, by Herr Kostlivz.

March 21.—On peculiar openings in the upper surface flower leaves of *Francisea macrantha*, Pohl, by Dr. Waldner.—On the electromotive force of metals in aqueous solutions of their sulphates, nitrates, and chlorides, by Dr. Streintz.—On the diffusion of carbonic acid through water and alcohol, by Dr. Stefan.

April 4.—The following, among other papers, were read:—On determination of electric resistance by the electrostatic method, by Herren Gruss and Biermann.—On the heat capacity of mixtures of methylic alcohol and water, by Herr Lecher.—Main features of the actinic theory of heat, by Herr Reschl.—The basaltic lava of the Eifel, by Herr Hussak.—On the organisation of the brain of invertebrates, by Dr. Dietl.—On the arrangement of the more recent tertiary formations of Upper Italy, by Dr. Fuchs.—On Canides from the diluvium, by Dr. Woldrich.

April 11.—New and rare fish of the Vienna museum, by Dr. Steindachner.—Two problems of the dynamical theory of gases, by Lieut. Schlemüller.—The products of the volcano Monte Ferru, by Prof. Doelter.—The geological formation of Attica, Bœotia, Locris, and Parnassus, by Dr. Bittner.—On great subterranean watercourses and reservoirs, and the purity and transparency of certain lakes, by Dr. Boué.—On peculiar properties of some astronomical instruments, by Herr Sterneck.

May 9.—The dolomite ridges of Southern Tyrol and Venetia, by Dr. v. Mojsisovics.—The reptiles and fishes of the Bohemian chalk formation, by Prof. Fric.—On the results of the meteorology of the present, by Herr Hann.—Fish fauna of the Magdalene stream, by Dr. Steindachner.—Nostocolonies in the thallus of the Anthoceroteæ, by Prof. Leitgeb.—On continuous acoustic rotations and their relation to the principle of surfaces, by Herr Haberditzl.—Comparative anatomy of the seeds of *Vicia* and *Ervum*, by Dr. Beck.—Experimental pathology of œdema of the lungs, by Dr. Mayer.—On the electrolysis of water, by Dr. Exner.—On the relative volumes of atoms, by Herr Wächter.—Development of Chætopoda, by Prof. Stossich.—Chemical composition of diastase and grape jelly, by Prof. Zulkowsky.—Interpolar electrotonus, by Dr. Fleischl.—On the internal friction of glycerine, by Herr Schöttner.

May 16.—On the colours which follow each other in Newton's ring system, by Prof. Rollett.—On azophenols, by Prof. Weselsky and Dr. Benedikt.—On the existence of man at the time of the loess formation, by Count Wurmbrand.—On the apparently secular variations of dry land, by Prof. Suess.

May 23.—On the course of spark-waves in the plane and in space, by Prof. Mach.—On the path of the Comet II. of 1873, by Herr Becka.—Influence of pressure and temperature on the spectra of vapours and gases, by Herr Ciamician.—Theory and application of electro-magnetic rotations, by Dr. Margules.—The laws of the individuality of planets of our solar system; attempt to found a general theory, by Herr Lehmann.—Stones

from the peninsula Chalcidice, by Herr Becke. On Berberin, by Dr. Weidel.

June 6.—The following, among other papers, were read:—Contributions to a knowledge of the colour-change of Cephalopoda, by Dr. Klemensiewicz.—On some problems of the mechanical theory of heat (continued), by Prof. Boltzmann.—On the cold-mixture of chloride of calcium and snow, by Dr. Hammerl.—On the gases arising from action of barium-oxide hydrate on albuminous substances, by Dr. Liebermann.—On the mica group (second part), by Herr Tschermak.

June 21.—The protoplasm of the pea (second part), by Prof. Tangl.—On development of hydrogen in the liver, and a method of production of butyric acid of fermentation, by Prof. Pribram.—On the specific viscosity of liquids, by Profs. Pribram and Handl.—Relations between electromotive force and chemical heat-tone, by Prof. Sekulie.—On the best method of showing details of the ethnography of a country with adequate accuracy and completeness in maps, by Prof. Boué.—On motion of electricity in space and Nobili's rings, by Prof. Ditscheiner.

July 4.—Map of the mountains of the moon, from personal observations in the years 1840–1874, by Dr. Schmidt, of Athens Observatory.—Fourth report from the Adria Commission, giving results of meteorological observations for 1871–73, and maritime observations for 1873.—Yearly periods of the insect fauna of Austria-Hungary, by Herr Fritsch.—Determination of the orbit of Comet V., 1874, by Dr. Gruss.—On the molecular size of indigo, by Prof. Lieben.—On heliotropic phenomena in the plant kingdom, by Prof. Wiesner.—On the friction of vapours, by Dr. Puluj.

### Rome

**R. Accademia dei Lincei**, May 5.—The following, among other papers, were read:—On fossil bones in the environs of Rome, by Sig. Ponzi.—On personal errors in observation of the duration of meridian passages of the solar diameter, by Sig. Respighi.—Catalogue of the mean declination of stars of the first to the sixth magnitudes, comprised between the parallels 20° and 64° N. lat. (first part), by the same.—Objections to the induction of Messrs. Humphrey and Abbot, and representation by means of a parabolic curve of the subaqueous velocity, by Sig. Fambri.—On the minute structure of the skin of reptiles, by Sig. Todaro.—Histological researches on the pigmental epithelium of the retina, by Dr. Angelucci.—On the serpentine of Verrayes in the Valle d'Aosta, by Sig. Cossa.—On the serpentine formation of the Pavian Apennines; report on memoir, by Sig. Taramelli.—Theory of the boraciferous soffioni of Tuscany, by Sig. Bechi.—Astronomical and physical observations on the axis of rotation and on the topography of the planet Mars, made at the Royal Observatory of Brera, in Milan, with the equatorial of Merx during the opposition of 1877, by Sig. Schiaparelli.

### Paris

**Academy of Sciences**, July 22.—M. Fizeau in the chair.—The following among other papers were read:—On the theory of fermentation, by M. Pasteur. He takes objection to the unauthorised posthumous publication by M. Berthelot of some laboratory notes of Claude Bernard, written in October last, and which seem to be opposed to M. Pasteur's views. The notes were those of experiments made in order to test to the utmost those views, not a manifesto against them. M. Berthelot replied.—On the electro-chemical deposit of cobalt and nickel, by M. Becquerel. He points out the priority of his father's and his own experiments on the subject in 1862.—On the variation of the intensity of currents transmitted through mediocre contacts according to the pressure exerted on them, by M. Du Moncel. He has made various observations on this subject since 1856, and in 1875 noted in metallic filings, &c., properties on which Prof. Hughes' thermoscope microphone is based.—Velocity of propagation of excitations in the motor nerves of muscles of animal life in mammalian animals, by M. Chauveau. The average velocity in frogs was first measured and found about twenty-one metres per second. In the pneumogastric nerve of solipedes great differences were observed both in different parts of the nerve and in different animals. In one ass the velocity in the recurrent branch of the pneumogastric was 51 m., in the pneumogastric 68 m., and in the intermediate section 66·5 m. *The activity of conduction decreases from the origin to the termination of nerves.* In *post-mortem* experiments this law is reversed. If the pneumogastric is cut the conduction is retarded somewhat without reaching the figure for the terminal portion of the recurrent nerve. Operating on the middle portion of nerves, the velocity is about the same in animals placed in the same physiological conditions. It is about 65 m. per second, and may rise to 75 m. in strong animals of high breed, or go below 40 m. in common weak animals.—Currents observed in the Suez Canal and consequences resulting from them, by M. de Lesseps. Lake Timsah and the Bitter Lakes act as regulators. The prevalent north and north-west winds from May to October raise the mean level of water at Port Said and depress it at Suez; hence in summer a current, interrupted by the tides, from the Mediterranean to the Red Sea, and finally driving a good deal of water southwards. In winter the reverse occurs. It is estimated that 400,000,000 cubic metres of water are thus annually driven to and fro. This, with the tides, tends to annihilate the effects of evaporation, and aid the dissolution of the salt banks of the Bitter Lakes.—Note on a new earth of the cerium group, and remarks on a method of analysis of columbates, by Mr. Lawrence Smith (sealed packet deposited September 22, 1877).—On mosandrum, a new element, by the same. The new earth was obtained from samarskite; and he established that it differed from that of the yttria group, from oxide of cerium, from lanthanum, and from didymium. M. Soret has, with the spectroscope, confirmed the existence of the metal constituting the base of this new earth.—Discovery of the periodic comet Tempel at Florence, by M. Tempel.—On an apparatus for demonstrating simultaneously the law of recoil of a gun and the law of motion of a projectile, by M. Sebert. The instrument is called a velocimeter.—On the tension of vapour and the freezing point of saline solutions, by M. Raoult. With regard to power of diminishing the tension of vapour, or retarding the freezing point, the different anhydrous salts rank in nearly the same order. The power of producing the one or the other effect is generally greater the smaller the atomic weight.—On the presence of lead in sub-nitrate of bismuth, by MM. Chapuis and Linossier. A method of detection is described.—On a new hexavalent non-saturated hydrocarbon diallylene, $C_6H_8$, by M. Henry.—On the presence of lithium in the earths and thermal waters of the Solfatara of Pozzuoli, by M. Luca. It is there found in very small proportion in the state of sulphate.—On the peripheric temperature in febrile maladies, by M. Couty. In febrile affections developed normally the temperature increases in the peripheric parts more than in the central, and there is equalisation, or a tendency to this, in all parts of the body.—Relation between manifestations of ozone and turning movements of the atmosphere; observations in 1877, by M. Gully. The coloration of the paper seems to be always greatest to the north of a centre of depression.

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